National Institute of Environmental Health Sciences

Climate change challenges: Vehicle emissions and public health in California

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Abstract:

Two of California's greatest environmental challenges are to meet national ambient air quality standards and to reduce greenhouse gas emissions that cause global warming. Although California has been struggling with air quality problems for more than four decades, concern over climate change is a relatively new phenomenon. Yet, the common ground between these two concerns is evident—both air quality and climate change policies aim to reduce the harmful pollutants that threaten the public's health and well-being. And one of the major culprits in both cases is the same—motor vehicles, the leading source of both smog-forming and greenhouse gas emissions. This study examines options for reducing emissions from motor vehicles and evaluates each of the options in terms of its public health, climate change, and cost implications, including the uncertainty associated with each option. We examine battery-electric vehicles, fuel cell vehicles, the use of ethanol blends in flex-fuel vehicles, and reductions in vehicle miles traveled. We find that increasing the use of battery-electric vehicles provides the greatest public health benefit per unit of GHG emission reduction, followed closely by the use of fuel cell vehicles, and then by reductions in vehicle miles traveled. However, all of these options involve tradeoffs, and none ranks favorably along all dimensions. For example, battery-electric and fuel cell vehicles provide significant public health and climate change benefits, but both options involve high cost and uncertainty. Flex fuel vehicles consuming fuel blends containing ethanol derived from corn, on the other hand, have fairly low technological uncertainty, but do not provide any significant public health or climate change benefit. Looking ahead, California needs to design policies that will reduce emissions from the transportation sector at a reasonable cost, while achieving maximum benefits for both public health and the climate. Policymakers, industry leaders, and the public need to understand the tradeoffs among these goals and seek to reconcile them. For example, there is still considerable uncertainty surrounding battery-electric and fuel cell vehicles, which will depend on technological breakthroughs and broader market penetration to reduce cost and meet performance targets. And while biofuels may help reduce global warming, their benefits will be greatly reduced if future policies are not also designed to account for their impacts on land use and their potentially adverse effect on food prices, depending upon the material used in their production. In the concluding sections of this paper, we discuss California's policy goals relating to air quality and climate change and the role of the transportation sector in meeting these goals. We also evaluate some of the policy options that California is likely to consider in terms of their climate benefits, public health impacts, and cost.

Source: http://www.ppic.org/content/pubs/report/R_310LBR.pdf

Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Air Pollution, Extreme Weather Event, Temperature, Unspecified Exposure

Air Pollution: Interaction with Temperature, Ozone, Particulate Matter, Other Air Pollution

Air Pollution (other): NOx

Extreme Weather Event: Wildfires

Temperature: Extreme Heat

Geographic Feature:

resource focuses on specific type of geography

Urban

Geographic Location:

resource focuses on specific location

United States

Health Co-Benefit/Co–Harm (Adaption/Mitigation):

specification of beneficial or harmful impacts to health resulting from efforts to reduce or cope with greenhouse gases

A focus of content

Health Impact:

specification of health effect or disease related to climate change exposure

Cardiovascular Effect, Morbidity/Mortality, Respiratory Effect, Other Health Impact

Cardiovascular Effect: Other Cardiovascular Effect

Cardiovascular Disease (other): Heart disease

Respiratory Effect: Asthma, Bronchitis/Pneumonia, Other Respiratory Effect

Respiratory Condition (other) : Chronic bronchitis

Other Health Impact: Hospitilizations

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Adaptation, Mitigation

Model/Methodology:

type of model used or methodology development is a focus of resource

Cost/Economic, Exposure Change Prediction, Outcome Change Prediction, Other Projection Model/Methodology

Other Projection Model/Methodology: GHG emissions

Resource Type:

format or standard characteristic of resource

Policy/Opinion, Research Article

Timescale:

time period studied

Medium-Term (10-50 years)